3D Microfabricated Low Loss Reconfigurable Components, Phase I

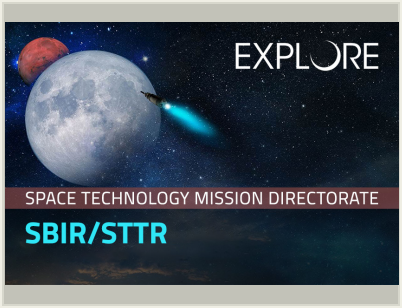
Completed Technology Project (2009 - 2009)

Project Introduction

Typical communication satellites use traditional waveguide front-end architectures due to excellent electrical performance and high reliability. However, these systems are extremely massive and use large volume mostly due to the low-insertion loss waveguide. Replacement of the waveguide components by microfabricated parts without substantially affecting the electrical performance can lead to a breakthrough in wireless communications. The overall goal of the proposed SBIR project is to develop low-cost, reliable, miniaturized RF MEMS switch components suitable for a variety of communication subsystems. Two approaches will be investigated. The first approach will be looking at monolithically integrating RF MEMS switches within the PolyStrataTM technology, developed at Nuvotronics in Blacksburg, VA as part of the DARPA 3DMERFS program. This approach should enable disruptive low-loss and high-Q RF components from S-band up to W-band. The second approach will rely on state of the art known good RF switches to be assembled on the low loss PolyStrata backplane. This second approach will provide lower loss, higher density and higher power handling than the current RF MEMS components. The proposed technology can be applied to multiple operating frequencies at a minimum cost due to the batch capability of the PolyStrata process.

Anticipated Benefits

Potential NASA Commercial Applications: Markets for analog and digital phase shifters include Microwave Solid-State Power Amplifiers, SSPAs for high-power TWT replacements also typically require phase-shifters as used in microwave transmitters and radar systems. A significant market is electronically scanned antennas which have broad applicability for both commercial and military applications. ESA markets include advanced military radars, cellular base stations, satellite communications, and automotive anti-collision radar. Unique to our approach is the potential to obtain both digital as well as analog operation. This can allow one product to meet requirements for low-cost and simple digital beam forming networks where basic several bit operation is needed as well as for high-resolution analog applications where the control and feedback circuitry for the analog shifting is desired. Our proposed tunable filters are applicable for both microwave and mobile communications receivers for band and frequency selection, for sensors and analytical tools, and for test and measurement equipment.



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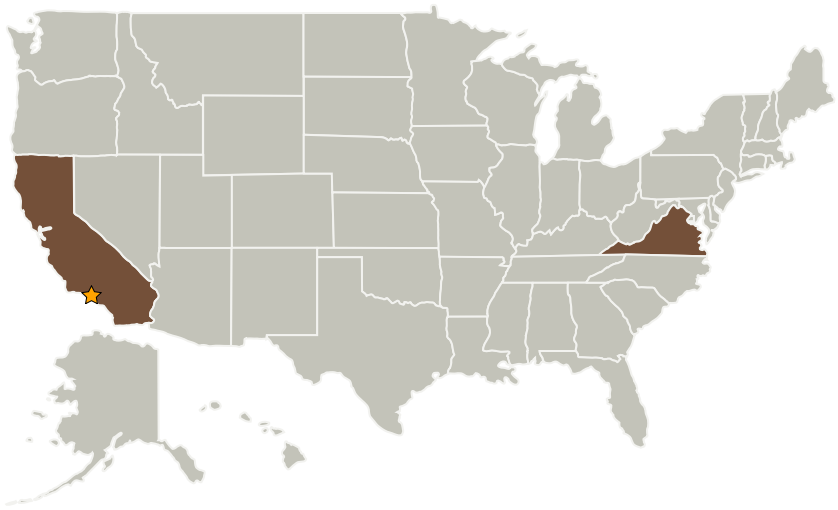
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Nuvotronics, Inc	Supporting Organization	Industry	Radford, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

January 2009: Project Start

July 2009: Closed out

Closeout Summary: 3D Microfabricated Low Loss Reconfigurable Components, Phase I Project Image

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

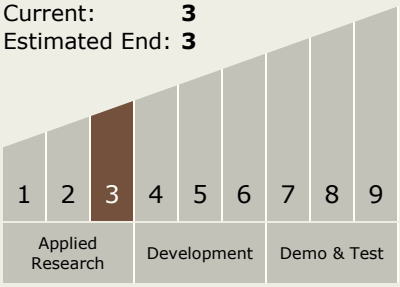
Carlos Torrez

Principal Investigator:

Jean Marc Rollin

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.2 Radio Frequency
    - TX05.2.7 Innovative RF Technologies